

SCIENCE.

FRIDAY, MAY 27, 1887.

COMMENT AND CRITICISM.

DR. ALBERT SHAW of the Minneapolis *Tribune*, always a writer worth reading on economic subjects, prints in the current issue of the *Contemporary review* a very practical article, entitled 'The American state and the American man.' The article was suggested by an incidental remark made by Mr. George J. Goschen, now chancellor of the British exchequer, to the effect that *laissez-faire* is the practical rule in the United States, and state interference the rare exception. Dr. Shaw discusses and combats this assumption. He says, first, that Mr. Goschen's opinion is not only generally entertained in England, but will be allowed to pass unchallenged by the vast majority of intelligent Americans. To begin with, *laissez-faire* is in harmony with our independent, self-reliant character as a people. It is the doctrine imbibed by the young men of the country in school and college. But while professing to hold *laissez-faire* doctrines, the American does not fashion his practice in accordance with them. "He studies his political economy in a text-book of abstractions, and not in the history of nations or the concrete conditions about him. Consequently he manages to keep his economics and his practical politics as separate as some men do their religion and their business, and he is just as naively unconscious of it." Two further observations are preliminary to Dr. Shaw's main discussion. We cannot properly estimate the extent of state interference in a western state by checking off correspondences on a catalogue of the various functions that have been assumed by the British government. Circumstances must be considered in estimating the extent to which the state invades the domain of the individual. And, secondly, it is not the functions of the general government, which touches the average citizen in so few points, that should be taken as the basis of computation, but rather those of the state and local governments.

Dr. Shaw then examines the legislation of the Minnesota state legislature during the sixty-day

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session of 1885. The number of laws that may be classed as instances of state interference is not only astonishingly large, but the laws themselves deal with the greatest variety of subjects. Prominent among them are the 'granger' laws concerning railroad and elevator supervision and control. Then come state loans of seed-grain to farmers whose crops had been ruined by grasshoppers. Agricultural fairs were subsidized and one hundred thousand dollars appropriated for a state fair-ground. Liberal exemption laws enable the farmer to avoid the payment of a portion of his debts. Dairy laws protect the butter-makers against artificial products, such as butterine. New laws regulate almost every detail of the cattle industry. Even brands are registered and protected by the state. Logging codes of minute detail regulate the lumbering trade. Insurance companies, savings banks, pharmacy, medicine, dentistry, and the oil trade are supervised and controlled. The fish and game laws are minute and exhaustive. One enactment specifies the maximum toll to be exacted by a custom mill for grinding wheat; another states when a dog may be slain with impunity; another prescribes in detail the character of the waiting-rooms which all railway companies must maintain at their stopping-places. The part played by the state in the matter of education is too well known to need mention. A bill was introduced, and found considerable support, which actually went so far as to forbid persons of opposite sex to skate together in a skating-rink, or even to be on the floor at the same time.

Dr. Shaw emphasizes the fact that bills of this character are passed by men who profess adherence to *laissez-faire* principles. But no connection exists between their political philosophy and their votes. The proper cure for this anomaly the writer finds in unlimited state interference. "Let it be understood that it is within the legitimate province of the state to do any thing and every thing." The result would be more scientific law-making. Each new proposition would be carefully scrutinized, and would have to stand or fall on its own merits. Whether Dr. Shaw's proposed remedy is the best and speediest may be

fairly questioned, but the careful observer of current politics must have noticed the increasing tendency to turn to the legislature for any thing and every thing. It is time to call a halt, and it is the duty of our students of political science to determine for us how this may best be done. The question is worthy of their most careful study.

THE FAITH-CURE and the mind-cure are at the present time attracting a great deal of popular attention; and almost daily, cures are announced, under this treatment, of persons who have, under all other methods, remained chronic invalids. It is not to be wondered at, that physicians denounce this treatment as charlatanism, but it was hardly to be expected that one of the most potent arguments against the validity of its claims should come from one of the clergy. In a recent sermon on this subject, Rev. E. C. Ray of Hyde Park, Ill., says, "Apparent cures are often followed by a relapse, temporary improvement by permanent decline. From reported cases of cure we must deduct many of unreported relapse: it is not in human nature, when a wonderful cure has been published abroad, to follow it up with an account of the relapse coming afterward. Mistaken diagnosis accounts for many supposed cures. Physicians often, patients more often, mistake the nature of a disease. Temporary swellings are called malignant tumors or cancers (thus cancer-doctors get their reputations); hysteria simulates almost every other disease, so as to deceive even the most elect of doctors; dyspepsia produces symptoms of heart-disease or other deadly illness. There can be no question that a large proportion of faith-cures and mind-cures, and a considerable proportion of cases under ordinary medical treatment, are cases of mistaken diagnosis, the disease being less serious in its nature than was supposed. Mistaken prognosis accounts for many cases; mistake as to what would be the outcome of the disease if no curative methods were employed. It is a truth seldom recognized by patients, though well known to physicians, that in most cases not hopelessly fatal from the start, there is from the start a strong tendency toward recovery. Dr. Austin Flint, Sr., than whom perhaps no abler physician has lived in this land, always urged upon his students the truth that not drugs, but *vis medicatrix nature*, the healing-power of nature, is the means of recovery. The wise physician and nurse seldom attempt more than

gently and humbly to assist Nature in her curative processes. Let me add the statement of a conviction derived from some years of such close scrutiny of medical practice of various schools as a pastor has good opportunity for, — a conviction agreed to, I think, by most physicians. The benefit of medicine is often not its direct action upon the disease or upon the body, but its action upon the mind, and through that upon the nervous system and the whole body, stimulating faith, hope, expectation of recovery, good cheer, which are probably nature's mightiest remedial assistants."

THE FIRST EDITION of Dr. Orton's preliminary report on natural gas and oil in Ohio was exhausted in a few months, and the publication of the final or complete report on the oil and gas of Ohio having been still further, though, considering the rapid developments still in progress, perhaps not unwisely, delayed by legislative action, Professor Orton has just issued a second edition, with a supplement, showing the marvellous results accomplished during the last year (1886). The extreme activity in drilling deep wells in all portions of the state, and especially in western Ohio, will make this year always memorable in the history of Ohio geology. The explorations of no single year hereafter can make additions of equal value to our knowledge of the stratigraphy of the state. The leading facts have now been established; and we know the order from one thousand to two thousand feet below the surface in every portion of the state as well as we do the arrangement of the strata on the surface. The vital relation of the production of oil and gas to the geological structure is well exemplified in the facts now thoroughly established, — that throughout western Ohio and eastern Indiana every important gas-well has pierced the Trenton limestone at a depth not exceeding four hundred feet below sea-level, and that every successful oil-well has reached the same horizon at a point less than five hundred feet below tide: in other words, the contours of the Trenton limestone are the all-important element to be considered in locating new wells, and they can only be determined by drilling. It has been demonstrated that the Trenton limestone, which has been heretofore supposed not to come to the surface in Ohio, is actually exposed in the bed of the Ohio River above Cincinnati. In northern Ohio the Utica and Hudson River shales have the normal character and thickness of those

formations in New York ; but toward the south they become gradually more calcareous, and the Utica also becomes thinner, and fails to reach the Ohio River ; the Hudson River series overlapping it, and reposing directly upon the Trenton. The lower Helderberg series, which has been heretofore assigned a total thickness of one hundred feet, is proved to measure five hundred, possibly six hundred feet, and to include all the beds in Ohio formerly referred to the Salina and Oriskany groups. The Cincinnati uplift, formerly supposed to have a north-easterly trend, is shown to run almost due north in northern Ohio, and to send off an important branch through north-eastern Indiana ; and it is along this branch that the important discoveries of oil and gas in Indiana have been made. The best gas-wells of north-western Ohio are now yielding from five million to fifteen million cubic feet each daily, and the oil-production for the entire field exceeds fourteen thousand barrels daily at the present time. The extent and rapidity of the development of the new districts are well shown in the statement that the Lima field alone now contains four hundred and twenty-four producing oil-wells, an average of more than one new well per day since the first discovery.

THE SUGGESTION of Captain Bartlett, chief of the U. S. hydrographic office, that an international convention be called for the purpose of assigning different portions of the ocean to each maritime nation, will probably be favorably considered by congress. It is believed that this would prevent casualties at sea by ships running into floating derelicts. Captain Bartlett says in his report, "Each nation would patrol its own portion of the ocean for the purpose of towing in or destroying all obstacles. Frequent reports are received of ships running into these derelicts, and the number lost from this cause may be considerable. If shipmasters felt that every attempt was being made by civilized governments to clear the ocean of these dangers, their anxieties, which are sufficiently great from purely natural causes, would be materially relieved."

THE POSITION OF EMIN PASHA.

It was in July, 1881, that Mohammed Achmed of Dongola, a carpenter, who had lived for some time as a hermit on the Island of Aba in the White Nile, declared he was the 'Mahdi,' the prophet whose arrival is expected by the Mohammedans

about this time. The number of his adherents increased rapidly, and belief in him was strengthened by the failure of several Egyptian expeditions to capture him. In an encounter with the Egyptian troops he braved their guns, and so the belief in his invulnerableness was established. The Egyptian government failed to understand the seriousness of this movement, though it was frequently warned by Emin Bey, the governor of the equatorial province. The Arabs and Dongolans, who had been masters of these countries before they were conquered by the Egyptians, joined the fanatic adherents of the Mahdi, and soon the movement had spread over the whole country. The government, which had only by the greatest efforts succeeded in subduing the revolt of Soliman Pasha in 1878-80, was powerless against the Mahdi. He retreated before an expedition sent from Khartum, to the southern parts of Kordofan, and in December, 1881, vanquished the mudir of Fashode. At this time the serious disturbances caused by Arabi-Pasha threatened to overthrow the Egyptian government, and delayed further action against the Mahdi. Thus the number of his adherents increased rapidly, and within a short time he commanded a large army. It is not necessary to dwell upon such events as the destruction of the Egyptian army, Gordon's defence of the Sudan, the final fall of Khartum, and Gordon's death.

In 1878 Emin Pasha was appointed governor of the equatorial province by General Gordon. When he entered upon his duties, the country was in a general state of war. Only the banks of the Nile beyond Lado, the district of the Mvutan Nsige, and the country inhabited by the Shuli, were quiet. Nubian slavers invaded the country and captured slaves without meeting resistance. Emin succeeded in driving them out of the country and gathering the scattered natives into their villages. Under his peaceful government many roads were built, and the cattle, the most valuable possessions of the district, increased in number. He introduced new manufactures and the culture of new plants, and thus improved the province, which in 1882 yielded an income of \$40,000, derived from taxes, while formerly it had an annual deficit of from \$100,000 to \$200,000.

At a time when the Egyptian government did not understand the seriousness of the disturbances caused by the Mahdi, Emin called attention to the imminent danger, but his warnings were disregarded. In April, 1882, during his visit to Khartum, he offered to treat personally with the Mahdi, and to use his personal influence and his acquaintance with the persons to bring about a *modus vivendi* between the parties. His offers

were rejected, however, and he received instructions to return to his province and develop its resources. He did so, but since that time the Mahdi has cut off his connection with Egypt, and the accession of King Mwanga in Uganda has cut off that with the south. A. M. Mackay the missionary, who is kept as a kind of hostage by the king, writes on June 26, 1886, in reference to this despot, "Again and again he has expressed his determination not to let us leave, being guilty in his conscience, and constantly alarmed by rumors from the east, partly arising from Dr. Fischer's journey that way, and partly from reports of the presence of what we think must be the main body of Bishop Hannington's caravan. . . . He has ordered our boats to be watched lest we should escape, and he is reported to have said that when he hears of an army reaching the Ripon Falls he will murder us at once, and then let the white men come and catch him. . . . Every time a fit of malice comes on, it is on suspicion that we mean to 'eat the country.' . . . Being alarmed, he is dangerous, while his insufferable conceit makes him obstinate" (*Scottish geogr. mag.*, Dec. 1886). It will be remembered that Junker found great difficulty in getting leave to return south.

The state of Emin's province in the summer of 1886 may best be seen from a letter written by him to Robert Felkin on July 7, 1886, which has been published in the *Scottish geographical magazine*. He says, "I am glad to be able to tell you that the province is in complete safety and order. It is true that the Bari gave us some little trouble, but I was soon able to restore order in their district. Since I last wrote you, all the stations are busily employed in agricultural work, and, at each one, considerable cotton plantations are doing well. This is all the more important for us, as it enables us, to a certain extent, to cover our nakedness. I have also introduced the shoemaker's art, and you would be surprised to see the progress we have made. We now make our own soap, and we have at last enough meat and grain, so that we have sufficient to keep life going; such luxuries, however, as sugar, etc., of course we have not seen for many a long day. I forgot to say that we are growing the most splendid tobacco. . . . Our relations with Kabraga have still continued friendly. He has also had the goodness to send my letters to Mr. Mackay in Uganda, and has permitted me to buy several necessary articles from the Zanzibar Arabs who live in his country. Captain Casati has, on this account, acceded to my wishes, and taken up his residence with Kabraga in the mean time, in order to look after our interests. Dr. Junker is at present in Uganda, and hopes soon to start on his

homeward journey. I am only too glad that he at least has been enabled to escape from here."

It will be remembered that the Mahdi, after the conquest of the province of Bar-el-Gasal, tried to attack Emin Pasha. His expedition, however, proved a failure. In the equatorial province communication was not interrupted at any time, and we hear of frequent journeys between Lado and the upper end of Lake Mvutan.

Since that time Emin's position has not become worse, as Junker succeeded in sending him from Uganda two thousand dollars' worth of cotton goods, and later news refer to goods bought by Emin's agents in Uganda. The latest letter of Emin Pasha is dated Dec. 18, 1886. He writes to Dr. Junker that King Mwanga allowed him to buy goods from Zanzibari merchants, and that he obtained permission to have ammunition and provisions sent from Zanzibar.

From these facts we conclude that Emin's position in his province is difficult on account of his isolation from Europe, but that there is no imminent danger. Therefore Stanley's expedition is not so much a relief expedition as one intended to provide him with such troops, guns, and ammunition as will enable him to hold his own in his province, and to continue the work he has so successfully begun. Evidently he is unwilling to leave his soldiers and officers, and to abandon a province in which, under the most adverse circumstances, he has restored peace, and saved the natives from the oppressions of corrupt officers and slave-hunters.

Stanley's expedition could not take the nearest and best-known route through Uganda, on account of the hostility of Mwanga. Neither was it advisable to avoid Uganda by passing north-east of the Victoria Nyanza; for the Waganda frequently make war upon the tribes of that district, while they do not visit the region west of Unyoro. Though Stanley experiences considerable difficulty in reaching Stanley Pool, his expedition has been so far very lucky, and there has been hardly any unexpected delay. Once on the upper Kongo, he will not find any difficulty in reaching the rapids of the Mburu, from which point his route will be easterly through an unknown country. It is not probable that his large caravan will meet any serious obstacle, and we may hope that he will succeed in accomplishing his object, thus enabling Emin Pasha either to return, or to continue his work in safety.

That our readers may be able to follow the doings in Central Africa, we publish with this number a map of the region, which is corrected to date.

INTERNATIONAL STATISTICAL INSTITUTE.

THE International statistical institute held its first meeting at Rome from April 12 to April 17. Among the distinguished scientists present were Sir Rawson W. Rawson of England, president of the institute; Signor Bodio, director-general of statistics in Italy; Professor Neumann-Spallart of Vienna; Professor Levasseur of Paris; Professor Wagner of Berlin; Dr. Engel, formerly director of the Prussian statistical bureau; Dr. Broch of Norway; and M. Léon Say of Paris. It was resolved that the working members of the institute should be limited to a hundred and fifty, and they are to be chosen exclusively from those who make a special study of statistics, and take a real interest in them.

One of the most important papers presented was that of Dr. Engel, on "Consumption as the measure of the prosperity of individuals, families, and nations." The paper is described as elaborate and ingenious, and gave a valuation of the minimum cost of maintenance from birth to the age of twenty-five. Dr. Engel calculates that an infant cannot be nourished from birth to the end of the first year at a less cost than five pounds, and that by the age of twenty-five each individual has cost, in the way of maintenance, not less than nearly three hundred pounds.

He also gave a statement of the estimated share of the earnings of a family, contributed by each member of it. The estimate is based on the cost of maintenance of a family consisting of a father and mother, and six children under eleven years of age. Taking the total as 16.1, Dr. Engel's figures, representing the consumption of the different members, are these:—

The father.....	3.5
The mother.....	3.0
One child eleven years old.....	2.1
One nine years old.....	1.9
One seven years old.....	1.7
One five years old.....	1.5
One three years old.....	1.3
One a year old.....	1.1
Total.....	16.1

Dr. Kekti of Hungary had a paper which confirmed Dr. Engel's conclusions, though it was written from a different point of view. Professor Ferraris of Italy read a paper on the movement of the precious metals between Italy and other countries, — a subject of peculiar interest to his countrymen, in view of their recent successful return to specie payments. Mr. Robert Giffen argued in favor of establishing a common measure of prices in different countries. Mr. Bateman, of the English board of trade, touched another important

point when he presented the question of how to establish a better basis than now exists for the comparison of the trade statistics of various countries.

THE MEETING OF THE ECONOMIC AND HISTORICAL ASSOCIATIONS.

THE fourth annual meeting of the American historical association, and the second annual meeting of the American economic association, opened at eight o'clock on Saturday evening, May 21, in Huntington hall, of the Institute of technology, Boston. Among the members of the associations present were Francis A. Walker, Justin Winsor, Alfred Emerton, Dr. F. W. Taussig, Prof. C. F. Dunbar, and Prof. W. W. Goodwin, of Harvard; Prof. A. T. Hadley of Yale; Profs. R. M. Smith, F. J. Goodnow, E. M. Smith, N. M. Butler, and E. R. A. Seligman, of Columbia; Prof. Alexander Johnston of Princeton; H. C. Adams and ex-President A. D. White of Cornell; Profs. E. J. James and C. J. Stillé of Philadelphia; Profs. H. B. Adams and R. T. Ely of Baltimore; Dr. Philip Schaff, Judge C. A. Peabody, Hon. John Jay, and General Cullum, of New York City.

President Walker's opening address was a brief analysis of the present industrial status. He followed the development of thought with reference to the manual-laboring class, and pointed out the sources of our present industrial troubles. He was most outspoken in condemnation of the boycott and of the methods of the demagogues among the Knights of labor. His appeal for a re-assertion of the spirit of American men and American institutions as against the methods of our immigrant population was forcibly stated, and was greeted with enthusiastic expressions of approval.

President Winsor of the Historical society followed with a scholarly address on the 'Documentary sources of American history.' He told what had been done by Jared Sparks, Peter Force, and George Bancroft for the collection and publication of state documents. He instanced the history of the Trumbull papers as evidence of what vicissitudes important documents might be called upon to pass through. He closed with the practical suggestion, that, before it is too late, the U. S. government should establish some body, like the Historical manuscripts commission of England, charged with the task of collating and preserving papers of value for the history of the development of the political life and thought of the country.

After the addresses a reception was tendered the members of both associations by the trustees of the Museum of fine arts, in that building.

On Monday, the 23d, both associations settled down to work. At the morning session of the Historical association a most valuable paper was presented by Judge Mellen Chamberlain of Boston, on "The constitutional relations of the American colonies to the English government at the commencement of the American revolution." Judge Chamberlain's argument was purely legal, and called forth from Professor Johnston of Princeton a few remarks on the relation of the legal to the political argument in considerations of this sort. The other papers of this session were 'Historical grouping,' by James Schouler; 'Diplomatic prelude to the seven-years' war,' by H. E. Mills; and 'Silas Deane,' by Charles Isham.

The corresponding session of the Economic association was devoted to the transportation problem, and developed many points of interest. The standing committee on transportation presented a report which indicated the plan of the work to be undertaken. Professor James of Philadelphia gave an historical *résumé* of the agitation for national regulation of the railways in the United States, and a notice of the Windom report of 1873, and the Cullum report of 1886. The interstate commerce bill he regarded as tentative, but as a step in the right direction.

Dr. Seligman of Columbia followed with the most valuable paper of the session, on the 'Long and short haul clauses of the federal railway law.' Dr. Seligman entered minutely into the subject of railway charges, and explained carefully and clearly the phrase 'what the traffic will bear.' After showing the difference between differential and preferential rates, the speaker defended the former on grounds of public policy, while heartily condemning the latter. Dr. Seligman was very emphatic in his assertion, and very clear in his proof, that the charge for railway service should be based, not on its cost, but on its value. From this principle follow classification and discrimination. Dr. Seligman concluded, "Under a system of free competition among private railways, the principle of volume of service, or charging what the traffic will bear, is the only rational method calculated to give the most efficient service and greatest profits. But the existence or possibility of the abuse of power requires the restriction of this unlimited liberty in the public interest. The reconciliation of the railways and public interest can take place only through the interposition of public authority. The public authority must lay down the rule of equal treatment as the fundamental doctrine, but must recognize the principle of value as a reason for departing from the doctrine in individual cases. Omission of either duty necessarily entails injustice or inefficiency." Si-

mon Sterne, Esq., followed with a paper on European railroads, and an animated discussion ensued, participated in by Professor Hadley of Yale, Simon Sterne, and Edward Atkinson of Boston.

In the afternoon both associations were entertained at Wellesley college by the faculty and students of that institution. At the evening session of the Economic association, Mr. Franklin H. Giddings, editor of *Work and wages*, offered a philosophical paper on the 'Sociological character of political economy.' Hon. John Jay read before the Historical association an essay on the 'Peace negotiations of 1783,' Dr. H. B. Adams gave an interesting account of Ranke's personality and work, and Dr. Francke of Harvard discussed the 'Parliamentary experiment in Germany.'

HEALTH MATTERS.

MOUNTAIN-CLIMBING. — Dr. L. Barkan of Brooklyn has contributed an article to the *New York medical journal* on the advantages of mountain-climbing. He regards the pure mountain air as one of the best of disinfecting agents. He says there are floating in the air numberless germs, many of them of a harmful nature; and it would seem possible that the injurious germs which, especially in large places, are received into the human organism, might be rendered innocuous by the oxygen of the air, and perhaps also by air-currents acting in a mechanical way, while in stagnant air — as, for example, in a badly ventilated apartment, where the exhalations from the lungs and skin are constantly accumulating — there is less disinfectant action because of the diminished quantity of oxygen. The best inhalation apparatus, baths, and medicaments, are of but temporary value, if no compensation is made for the loss of vitality and of muscular tone, especially that of the heart and vessels; if the blood stasis in the glands and other organs does not yield to an increased flow of blood in the arteries and veins; if the thinned blood does not become thicker and more rich in albumen; if the accumulating carbonic acid is not expelled by a more plentiful supply of oxygen; if the fat deposited in the body is not more rapidly oxidized; and if the kidneys are not made to act more efficiently. All these effects are produced, according to Jacobi, Loomis, Veit, Oertel, and other authorities, more certainly and more generally by mountain-climbing than in any other way whatever. After several weeks spent in mountain excursions, the condition of the patient is radically changed for the better. There is an elasticity of the mental processes in place of the former hebetude; will, thought, and impulse seem to move on wings; the

formerly dull senses are sharpened ; the formerly half-closed eyes sparkle, and the flabby cheeks become fuller and rosy ; the formerly prominent abdomen is reduced to more seemly dimensions, notwithstanding that food and drink are taken with greater relish ; and the chest is expanded. Dr. Barkan thinks the European mountains are to be preferred to those of America, principally on the ground that better paths are provided. He makes an exception to this rule in favor of the Adirondacks and some other mountains in the eastern states. In organizing mountain-parties, every thing should, so far as possible, be previously arranged. Regulations should be established as to the gradual increase in the extent of the daily ascents, the periods of rest, the protection of the feet and other parts of the body against chafing and the formation of blisters. The advice of Dr. Barkan will be found by inexperienced pedestrians to be of great value, and we should advise those who contemplate mountain-climbing during the coming summer to familiarize themselves with his rules of action, and thus save time and avoid suffering.

THE STOMACH. — Dr. A. H. P. Leuf, in an article in the *Medical news* on the stomach, calls attention to several important errors in the anatomy and physiology of that organ as described by most of the authorities. He finds, as the result of many post-mortem and other examinations, that instead of lying in a horizontal position, the stomach in its normal position is vertical, and that when it is distended the lesser curvature remains comparatively stationary, while the greater moves to the left and downward, and the pouch upward and to the left. An empty stomach is in a contracted condition, and assumes a tubular form : gaseous distention, though frequently found, is not the rule, nor is it strictly physiological. When water is taken into the full or partly full stomach, it does not mingle with the food, as we are generally taught, but passes along quickly between the food and the lesser curvature, towards the pylorus, through which it passes into the intestine. The secretion of mucus by the lining membrane is constant, and during the night a considerable amount accumulates in the stomach : some of its liquid portion is absorbed, and that which remains is thick and tenacious. If food is taken into the stomach when in this condition, it becomes coated with this mucus, and the secretion of the gastric juice and its action are delayed. These facts show the value of a goblet of water before breakfast. This washes out the tenacious mucus, and stimulates the gastric glands to secretion. In old or feeble persons, water should not be taken cold, but it may be with great advantage then taken

warm or hot. This removal of the accumulated mucus from the stomach is probably one of the reasons why taking soup at the beginning of a meal has always been found so beneficial. Dr. Leuf sums up his views as follows : 1°. The position of the stomach is more nearly vertical than horizontal ; 2°. An empty stomach, if in good tone, is always tubular ; 3°. A tubular stomach should be the rule on rising ; 4°. Non-irritating liquids pass directly through the tubular stomach ; 5°. They do likewise if the stomach contains food, and in such cases pass along the lesser curvature ; 6°. The morning mucus contained in the stomach hinders or retards digestion ; 7°. Water drank before meals dilutes and washes out this mucus, stimulates the gastro-enteric tract to peristalsis, and causes hyperaemia of its lining membrane, thus greatly aiding digestion as well as elimination ; 8°. Cold water should be given to those who have the power to react, while warm or hot water must be administered to all others ; 9°. Salt added to the water is very beneficial in preventing the formation of unabsorbable parapeptones ; 10°. It is perfectly proper to drink water before, during, and after meals.

CETTI'S FAST. — M. Cetti, who began a fast of thirty days at Berlin, maintained it but two weeks, having been assured that a longer deprivation would be of no scientific value. During the fast he was under the observation of such scientific men as Virchow and Senator ; and the results, when published, will undoubtedly be of great interest. He drank all the water he desired, and was permitted to smoke cigarettes. His average daily loss in weight was 585 grams. Accurate measurements of the body were taken, and minute analyses of the excreta made from time to time : also examinations of the blood and sphygmographic tracings of the pulse. Estimations were also made of the amounts of oxygen absorbed, and of carbonic acid produced, during respiration.

WATER - SUPPLY AND TYPHOID - FEVER. — Dr. Charles Smart, surgeon U.S.A., regards the water-supply as the principal medium of the transmission of typhoid-fever, and refers to the statistics of New Orleans and Philadelphia as sustaining his views. In the former city, without a sewer system, the drinking-water is pure rain-water ; while in Philadelphia, with a sewer system, the water-supply is contaminated. The death-rate per 100,000, from typhoid-fever in New Orleans, in 1866 was 68, and in 1885 but 16 ; the average for the first decade, 1866-76, being 41.3, and for the second, 24.6, a decrease of nearly 17. In Philadelphia the average for the first decade was

55.8, and for the second, 66.1, an increase of nearly 11. In considering these statistics, it would seem that the transmission of typhoid-fever by means of sewers is overlooked. In Brooklyn the outbreak of 1885 was distinctly traced to communication through sewers, and it was also fairly well demonstrated that the water-supply played no part at all in the transmission of the disease. The fact is undoubtedly that typhoid-fever is communicated both by means of sewers and the water-supply, and that neither is to be regarded as the sole factor in its propagation.

PASTEUR'S WORK. — Pasteur is at the present time being very severely criticised by his opponents, some charging him with causing the death of his patients by his inoculation experiments. The following table of statistics, taken from the *Lancet*, would seem to indicate, that, notwithstanding the adverse criticisms, Pasteur's claims to having saved life are established on a substantial basis.

	No. of cases treated.	Deaths from all causes.	Mortality.
Paris.....	2,730	45	Under 2 per cent
Odessa.....	325	12	" 4 "
St. Petersburg...	118	1	" 1 "
Moscow.....	112	2	" 2 "
Vienna.....	96	0	—
Warsaw.....	84	0	—
Naples.....	48	0	—
Samara.....	47	2	Under 5 per cent
	3,560	62	Under 2 per cent

These statistics include those treated up to the close of 1886. Since then, twelve or fifteen more deaths have occurred, making the total mortality less than 80, or $2\frac{1}{4}$ per cent. In contrast with this, we find the rate of mortality after bites of rabid animals to be about 16 per cent; or, in other words, the treatment pursued by Pasteur and those who have practised his method elsewhere, has been followed by but one death, while without the treatment there would have been seven deaths, per thousand.

GEOGRAPHICAL DISTRIBUTION OF CONSUMPTION. — The New Sydenham society has recently published the third volume of Hirsch's 'Handbook of geographical and historical pathology,' in which the author treats of pulmonary phthisis. He finds

the disease to be one of all times, countries, and races. Its mortality is 3 per 1,000, or nearly one-seventh of the total mortality. In Vienna the rate is 7.7 per 1,000; in Berlin and Dresden, but 3.8. Among nomad tribes, the Kirghiz of Central Asia and the Bedouins of Arabia, phthisis is almost unknown. When, however, these tribes change their abodes and dwell in towns, then the disease appears among them. The conclusions of Professor Hirsch are as follows: 1°. Phthisis is everywhere prevalent, but it is rare in polar regions, and rarer still at high altitudes; 2°. The main factors in its production are over-crowding and bad hygiene; 3°. Heat and cold, *per se*, have no influence; 4°. Damp, when conjoined with frequent oscillations of temperature, predisposes to the disease, but humidity of the air is less important than dampness of soil; 5°. Occupation is extremely important, but mainly indirectly, as tending to good or bad hygienic conditions.

WHOOPIING-COUGH. — At the sixth German congress for internal medicine, held at Wiesbaden in April, the subject of whooping-cough was discussed. Professor Vogel of Munich regards the disease as infectious. In an epidemic which occurred at Wurzburg, 52 children under one year of age were affected, and 13, or 25 per cent, died; 248 between one and five years were also affected. Of this latter number, 12, or 4.8 per cent, died; while between the ages of six and fifteen years there were 87 cases, of which but one case, or 1.1 per cent, was fatal. Professor Hagenbach of Basle said that 240,000 children in Germany have this disease annually; the mortality being, on the average, four or five per cent. He regards it as communicable so long as much mucus is produced. Schools should be most carefully watched, and children who have paroxysmal coughs should be excluded; and, if the disease occurs and spreads, the schools should be closed. The moving of children from place to place for change of air is often the cause of an epidemic in places free from the disease.

MENTAL SCIENCE.

Para-psychology.

WHEN, through disease of the nerves or the action of drugs, the sense-organs lose their sensibility, the state thus produced is called 'anaesthesia;' when, for similar reasons, their activity is unduly heightened, the condition is spoken of as 'hyperaesthesia;' and when the abnormality of sensation consists in the production of unusual effects by ordinary stimuli (for example, when every touch is regarded as the creeping of an ant

over the skin, or when the two points of a compass seem as three), the condition is termed 'paraesthesia.' By analogy the term 'para-psychology' may be invented to apply to those weirdly imaginative systems of thought by which some intellects strive to satisfy their inner longings, and to make the world seem rational. For these persons the advance of science has no meaning; to them it is simply painfully slow and accurate walking; while their ideal of locomotion is flying in a frictionless ether.

An exquisite example of this type of mind (which, by the way, often contains a kernel of sound truth) is exhibited in a recent attempt to portray the evolution of human consciousness in a series of highly symbolic and complex geometrical diagrams. The author of the work began his career as an architect, but, dissatisfied with his profession, went to India to pursue 'the study of internal truth,' and spent twenty years in completing this elaborate system of symbolism. A frank admission, that, like many of the persons to whom these diagrams were shown, the present writer does not understand them, will readily excuse him from giving an exposition of their meaning. All that can be done is to piece together a few sentences from this geometrical symbolism. There are five standing-grounds of human evolution, — from the first, representing sense-perception; to the second, which is merely negative and unrepresentable; to the third, the sphere of self-sacrificing duty and spiritual enlightenment; to the fourth, again an unthinkable negative stage; culminating in the fifth, a stage, though positive, yet so ideally spiritual as to entirely surpass our finite conceptions, and only glimpsed perhaps now and then by a supersensitive clairvoyant. The first stage is represented by a plane; the third finds its representation in three dimensions; while the fifth would require a fourth dimension to do it justice; the intermediate negative stages being entirely unrepresentable. On the first plane the forms take the shape of leaves; a pointed apex indicating a male form, or Ond, while a rounded apex indicates the female form, or Onde. The limit of the one is a straight line, the symbol of severe intellect; of the other, a circle, symbolizing all-embracing emotion. In the third stage the leaves become flowers, with trumpet-shaped corollas for the males, and bell-shaped for the females; with colors suggested by spinning the plane forms (cut out of cardboard) in a dark room illuminated by a beam of light, and a host of symbolic details mirroring nothing less than the entire history — past, present, and future — of the human race. Add to this a painstaking forcing of all these

botanical forms by a fanciful application of arithmetical, geometrical, and harmonic progressions; intersperse this with a sprinkling of theosophic cant and vague word-philosophemes, — and some notion of this para-psychological system will perhaps result. If not, it is only necessary to add, that the author has frequently drawn horoscopes, has discovered that our solar system is a male universe and is represented by the use of this geometry by a nine-petaled lily, while the earth (*mirabile dictu*) finds its symbol in a form like ☿, which was actually used by astronomers for this purpose.

That all this is full of life and meaning to its author, and will be suggestive to many readers, there is no reason to doubt; any more than there is to doubt that he was unconscious of forcing his diagrams into the shape of leaves and flowers instead of their teaching him that each heavenly body was mirrored in a plant below.

Apart from the sad spectacle of misused talent (and that can be seen in any insane-asylum), the survey of such a system emphasizes by contrast the moral value of logical method, and illustrates the great dangers of mono-ideism, and of that unchecked imagination which has prepared so many victims to the snares of a mad symbolism.

THE COMPARATIVE INTENSITY OF SENSATIONS. — M. Bloch has compared the relative strength of sensations by finding which of two exactly simultaneous sensations is perceived first. He first had a bell struck and a white paper appear nearly at the same time, and found, that, if the sound comes $\frac{1}{36}$ of a second before the white streak, one heard before one saw. If the two are still closer together, they seem to be simultaneous, and remain so until the streak is $\frac{1}{36}$ of a second before the sound, when the sight precedes hearing; so that within these limits ($\frac{1}{36}$ of a second before, and $\frac{1}{36}$ of a second after) there is practical simultaneity. From this is calculated that it takes $\frac{1}{72}$ of a second longer to hear a sound than to see a sight. From a similar series of experiments it was found that it took $\frac{1}{21}$ of a second longer to feel a touch than to see a sight; so that the order of intensity — meaning by this the power a sensation has to attract attention and get first into consciousness — is sight, hearing, touch.

THE BLIND IN CHINA. — Mr. W. H. Murray, an Englishman, has been the means of introducing into China a system of writing the Chinese characters in raised print. When we consider the complexity and multitude (about four thousand) of Chinese characters, and remember that the smallest of China's eighteen provinces is equal in ex-

tent to England (and England has forty thousand blind), the vastness of this philanthropic work will be apparent. Mr. Murray noted the actual sounds used in speaking Chinese, and succeeded in reducing these to four hundred, each being represented by a different arrangement of dots. He tried his first experiment on a blind beggar taken from the streets, and in six weeks taught the boy to read, and even to write a little. The fame of this experiment soon spread, and pupils crowded to be taught. The system was extended to include music and to adapt itself to the various dialects, — no mean task, since the Bible must be printed in eight different sets of characters to be understood all through China.

EXPLORATION AND TRAVEL.

Danish explorations in East Greenland.

It is stated in Copenhagen, says *Nature* of May 5, that an expedition will be despatched late this summer by Herr A. Gamil, the equipper of the *Dijmphna* expedition of 1882, to the north-east coast of Greenland. It is hoped that the explorers may reach a higher latitude than that attained by Lieutenant Holm in 1884. The expedition will be commanded by Lieutenant Hovgaard, who in 1882 commanded the *Dijmphna*.

It will be remembered that Holm made a successful exploration of the east coast as far as latitude $66^{\circ} 20'$ north in 1884 and 1885. He started from the west coast in several Eskimo boats, and, by the help of the natives, reached the fiord of Angmagsalik. His observations on the ice phenomena of this coast show that the sea is probably navigable during a great part of the year. There is little or no ice close to the coast in the autumn and during the early part of winter. In January and February heavy masses of ice lie close to the shore, and remain there until late in spring. In June or July they begin to disappear. From these observations, it appears that the coast can be reached by vessels late in the season, and the new expedition will probably make use of this experience. It is a remarkable fact that in arctic America those places are most easily approached where the coast makes a slight outward turn, while concave bends of the coast are always difficult to approach. The east coast of Greenland was reached by Scoresby near Scoresby Sound, and by Nordenskjöld at Cape Dan. At both points the coast makes a turn. South of Cape Dan we find a slight concave bend, which is always filled with closely packed ice. The same fact may be observed in Baffin Bay and Davis Strait. The bay of Julianehaab is always full of ice, and the land cannot be reached here, while farther north there

is only loose ice under the coast. The west ice of Baffin Bay can be crossed most easily near Cape Walsingham and Cape Kater, — the middle water of the whalers. This phenomenon is easily accounted for: on the straight or concave coast the ice is pressed against the land, while on the points there is room for it to spread out. There are many questions of great interest to be solved on this coast, — the extent of the inland ice, an exploration of the enormous sounds of Scoresby Land and King William Land, and the northern limit of man. On his visit to East Greenland, Scoresby met Eskimos in latitude 70° north. The German expedition of 1869–70 found the ruins of their houses at the farthest point reached. Many facts make it probable that the Eskimos travelled around the north point of Greenland; and therefore a study of the most northern tribes of the east coast is of particular interest from an ethnological point of view, and for the decision on the feasibility of the exploration of the north coast of Greenland.

Polar regions.

According to the Proceedings of the Royal geographical society for May, Sir Allen Young, the well-known arctic explorer, has offered his services to the Australian colonies to lead an expedition to the antarctic regions. Acting on this offer, Sir Graham Berry has brought the question of a government grant towards the cost of the enterprise (stated to be \$40,000) before the cabinet, and the matter is being urged forward with a view to the vessel or vessels starting from Hobson's Bay in October or November next. The object of the expedition is to be entirely geographical, but incidentally much advantage is expected to accrue to the whaling and sealing interests, which would profit by the information gained. While thus an important further step has been taken to promote the Australian expedition, it seems that the reports on Nordenskjöld's plans were not well founded. It may be that he plans an expedition towards the south pole, but so far no funds are available for this purpose.

The season of arctic travels is also approaching. Mr. K. D. Nosilof, a Russian explorer, announces to the French geographical society (*Compt. rend.*, No. 7, 1887) his intention to visit Nova Zembla. Nosilof has spent three years in exploring the northern Ural to find a practicable route to Siberia. This was done at the expense of Mr. Sibirakof, who has given up his intention of establishing regular communication by sea between the Obi and Archangel. On his new expedition, Nosilof intends to make a detailed survey of the coasts and of the interior, and to study the

movements of the ice of the Kara Sea. Besides, he intends to study the natural history and ethnology of that district.

In America, Colonel Gilder is going to resume his work, which was interrupted last winter. He intends to return to Hudson Bay, and to start on his expedition north with the Eskimos of Wager River, with whom he became well acquainted at the time of Schwatka's sledge-journey to King William Land, of which he was a member. He hopes to be able to reach Iglulik, in Fury and Hecla Strait, in the spring of 1888, and Lancaster Sound in the summer or autumn of the same year.

NOTES AND NEWS.

THE department of agriculture has issued a paper prepared by Professor Riley, on the defoliation of shade-trees in Washington. The four principal leaf-eaters are the imported elm-leaf beetle, the bag-worm, the white marked tussock moth, and the fall web-worm. The beetle, Professor Riley says, has done much mischief in the old world. It was first imported here in 1837, and its earlier destructive attacks were notably about Baltimore and New Jersey. The bag-worm for two or three years has been on the increase in special localities in Washington. Speaking of the enemies of these worms, he says, "The 'pellets' of a screech-owl found in the vicinity of Baltimore consisted apparently almost entirely of the hairs of these caterpillars, proving that this useful bird has done good service. Perhaps the statement may be of interest that this little owl is getting much more common in the vicinity of cities in which the English sparrow has become numerous, and that the imported birds will find in this owl as bold an enemy as the sparrow-hawk is to them in Europe, and even more dangerous, since its attacks are made toward dusk, at a time when the sparrow has retired for the night, and is not as wide awake for ways and means to escape. If our two cuckoos, the black-billed and yellow-billed species, could be induced to build their nests within the city limits or in our parks, we should gain in them two very useful friends, since they feed upon hairy caterpillars." Speaking of a remedy for these pests, Professor Riley says, "It so happens, fortunately, that there is one thoroughly simple, cheap, and efficacious remedy applicable to all four of these tree-depredators. They all begin their work very much at the same season, or as soon as the leaves are fairly developed; and arsenical mixtures properly sprayed on the trees about the middle of May, and repeated once or twice at intervals of a fort-

night later in the season, will prove an effectual protection to trees of all kinds."

— A committee of the Association of German physicians has sent a circular to the directors of all the gymnasia of Germany, asking them to dissuade students from adopting the medical profession. Accompanying the circular are statistics which show the proportion between the number of physicians licensed each year and the number who die or retire from the profession.

— A second edition of Lancaster's '*Liste des observatoires et des astronomes*' has appeared. We are glad to learn that there is a prospect of further editions being published, as they may be required to keep pace with the movements of astronomers. This little directory will be found useful not only by astronomers, but by booksellers and others who may wish to be put in communication with the astronomical world. The index contains about a thousand names.

— Trübner & Co. announce the first volume of the '*Reports of the Archeological survey of southern India, the Amarâvatî and Jaggayyapeta Buddhist Stûpas*,' by James Burgess, director-general of the Archeological survey of India; together with transcriptions, translations, and elucidations of the Dhauli and Jaugada inscriptions of Asoka, by Prof. G. Buhler, Vienna. Dr. Burgess, the director-general of the Archeological survey of India, is just finishing a volume on the Amarâvatî and Jaggayyapeta Stûpas, illustrated by more than fifty collotype and lithographic plates and numerous woodcuts. It will be remembered that the second part of the late Mr. James Fergusson's '*Tree and serpent worship*' (now out of print) dealt with the marble sculptures brought by Col. C. Mackenzie and Sir Walter Elliot at different times from the Amarâvatî Tope or Stûpa, and which are now in the British museum. Dr. Burgess spent some time at Amarâvatî immediately after the excavation of the site by orders of the Madras government, where he made further researches, discovering about ninety fresh sculptures, and forwarded about a hundred and eighty slabs to the Madras government museum, which he also carefully photographed. On the spot he made many drawings, and copied all the Pali inscriptions, which are numerous, and, though short, are of considerable interest. One in particular he discovered, bearing the name of Pulumâyî, one of the great Andhra sovereigns of the second century, which is of the utmost value in determining the age of the Tope. The date of the monument proves to be earlier by about a century and a half than Mr. Fergusson had estimated it; but this seems to be solely due to the

want of date, when the latter wrote, by which to fix the age of the Nasik inscriptions of the Andhra kings. It is one evidence of the value of the epigraphical researches by the Archeological survey that they enable scholars to determine, within so very narrow limits as Dr. Burgess is understood to prove, the age of so interesting a monument as this of Amarâvatî. At Jaggayyapeta, a large village farther up the Kistna River, and close on the Hyderabad frontier, Dr. Burgess discovered another ruined Stûpa. This is also described and illustrated, and the inscriptions from it translated. Though much smaller than that at Amarâvatî, it proves to be of much earlier date; and its very archaic sculptures, though few and much injured, are of the greatest interest in the illustration of early Indian art. The work is all in type, and only waits the completion of some of the plates, which may be expected within a short time.

— The garbage crematory at Wheeling, W. Va., is said to be completed, and to have stood the tests which have been applied, to the satisfaction of the authorities. Pittsburgh, Penn., is also endeavoring to solve the difficult problem of the disposal of garbage, and has advertised for bids to construct furnaces. We regret to learn that the Milwaukee, Wis., authorities have decided to remove the garbage of that city to the country, and there bury it in the ground. Such a method of disposal is, at the best, unsanitary, and can be but a temporary relief.

— Dr. Albert Kellogg, the pioneer botanist of the Pacific coast, and the last surviving charter member of the California academy of sciences, died at Alameda, March 31, 1887.

— The U. S. coast-survey parties on the Pacific coast are now all in the field. Assistant Pratt, on the west coast of Washington Territory, will complete the astronomical and plane-table reconnaissance from Cape Flattery to Gray's Harbor, over a region which has been traversed by few persons, and has been absolutely unsurveyed except for the hydrographic reconnaissance made by Captain Alden early in the fifties. The preliminary astronomical and topographical reconnaissance and survey along the coast of Washington Territory from Columbia River to Port Orford, under the charge of Assistants Rockwell and Dickens, will also be completed this year. The magnetic apparatus at Los Angeles is giving splendid results, almost unbroken curves having been maintained at this station for several years. Every great earthquake which has occurred has affected the magnetic elements, and has been faithfully recorded, some of the waves in lines of the record being quite remarkable. The steamer Blake, on

her way from the Gulf Stream explorations which have been in progress on the south of Key West, will call at Brunswick harbor, Georgia, and make an examination of that bar, at the request of citizens interested in the progress of the port. The Blake will also stop at Cape Fear, and will make a hydrographic survey in that vicinity, where remarkable changes have occurred in the last twenty years. Two topographic parties and one hydrographic party are now at work on the coast of Maine in the vicinity of Cobscook Bay. The surveys on this coast are rapidly approaching completion.

— Commercial Agent Smith reports from Mayence that the peronospora, which is a pest as rapacious as the phylloxera, has made its appearance in the vineyards of Germany, threatening to accomplish on the Moselle and Rhine what the phylloxera has failed to effect,—the destruction of the vineyards on the banks of those rivers; and the vine-dressers are filled with alarm for the future. The chamber of commerce at Coblenz has called the attention of the government at Berlin to the pest, and asks that the remedy adopted in America, of burning the leaves upon which the insect has fixed itself, be employed by the police.

— The navy department has just issued a fine submarine cable chart of the world.

— The U. S. fish commission sent a car last week with 4,000,000 shad-eggs and 1,500,000 shad-fry to New York state for stocking the waters of the Hudson River.

— The international convention just ratified by the President, securing patentees in the United States the right to take out patents in other countries at any time within seven months after letters have been issued to them by our government, confers a privilege which will be highly valued by inventors.

— Lieut. John P. Finley of the signal office has just issued a new publication on the subject of tornadoes.

— Gen. A. W. Greely, chief signal officer, has received from the secretary of war a gold medal presented to him by the Paris geographical society, in recognition of his valuable contributions to the knowledge of high latitudes.

— In May, 1887, Messrs. Ticknor & Co. begin the publication of a set of handsome and convenient paper-covered volumes, for leisure-hour and summer-day reading, to be made up of some of the choicest and most successful novels of late years, together with several entirely new novels by well-known and popular writers. They will be issued regularly, once a week, for three months.

— Prof. W. G. Peck, LL D., is writing an 'Analytical mechanics' for the use of colleges and scientific schools, embracing the course as now taught at the School of mines, Columbia college. Messrs. A. S. Barnes & Co. will publish it in the early summer.

— Messrs. Ticknor & Co. announce for publication 'The Nigritians,' division 1 of 'The social history of the races of mankind,' by A. Feathermann; also 'The Melanians,' division 2 of 'The social history of the races of mankind,' by A. Feathermann. These two learned volumes are parts of the great group which was begun by the publication of 'The Aramaeans' two years ago. When all the volumes of 'The social history of the races of mankind' shall have been published, the work will be found to be a comprehensive history of universal civilization, embracing not only the civilized and most enlightened nations of the earth that exist now, or had existed in the remotest ages, but treating equally of savage and barbarous races, tribes, and nations, such as are historically known to have existed in ancient time, and such as exist now in Africa, Oceanica, America, in the north of Europe, and in many parts of Asia.

LETTERS TO THE EDITOR.

**The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The cause of consumption.

In regard to the so-called 'theory of consumption' developed by Hambleton, as described in a recent number of *Science* (ix. No. 221), I think that our knowledge of the cause of tuberculosis is now so definite and precise that communications of that nature are positively pernicious, if not made with more discrimination, because they confound the cause of the disease with the favoring or retarding influences under which it may progress, and thus draw off attention from one of the most important measures which must be taken to guard against the contraction and perpetuation of the disease.

It is now definitely established that tuberculosis is caused, and caused alone, by the presence and action in the body of the bacillus tuberculosis. Tuberculosis can no more appear in the body without the previous entrance of the bacillus than a crop of corn can spring up in the soil without the previous deposition in some manner of the seed. And to gravely discuss the probability of tuberculosis originating in the body from any set of conditions not associated with the bacillus tuberculosis is precisely analogous with speculations as to the conditions of soil, climate,

etc., which could cause a crop of corn to spring up spontaneously in a field.

As your correspondent 'Medicus' points out, Hambleton's array of facts affords strong confirmatory evidence of the infectious nature of the disease, and shows the important influence on the development and progress of the disease of certain external conditions of individuals and people.

Before the discovery of the bacillus tuberculosis, such hypotheses as Hambleton's were frequently elaborated, and were useful as the best which could be done at the moment. The facts upon which they were based are still more useful to-day, but conclusions from them should not be permitted to assume a false relationship to the real causative agent in tuberculosis.

At present it does not seem probable that tuberculosis, when once definitely established in the body, can be successfully combated by the administration of drugs for the direct destruction of the bacilli, although new methods of treatment based upon this possibility are frequently suggested, and find one after another a short-lived currency. It appears very doubtful whether the body can be sufficiently saturated with any form of germicide to insure the complete destruction of the bacilli without destroying the life of the individual.

But, on the other hand, much has been, and much more may still be, done in the way of assisting the cells of the body in their natural warfare against the invaders; as by the supply of suitable foods and the furnishing of favorable hygienic and climatic conditions. Heredity is, without doubt, an important element in the origin and progress of the disease, but it is unquestionably not a directly etiological but only a secondary determining or accessory factor.

When the public and the members of the medical profession are sufficiently impressed with the overwhelming importance of the primary infection of the body with the bacillus tuberculosis—apparently in most cases from inhalation with dust of the bacillus or its spores—in the causation and perpetuation of the disease, and are thereby led to urge and practise the universal destruction or disinfection of sputum and all other discharges from tuberculous individuals, we shall have taken the first step towards what appears to be our only real and well-grounded hope of effectually stamping out the disease. The safeguards which we provide, or ought to provide, against the invasion of Asiatic cholera, consist in the destruction of the bacterium which causes it, and although far more difficult of accomplishment, owing to its constant and universal presence, this is the task to which we must address ourselves in the face of the far more important disease, tuberculosis.

In the event of an invasion of Asiatic cholera, we should indeed consider and attempt to guard against those conditions which seem to render an attack of the disease more likely, such as digestive disturbances, over-exertion, etc., and we should bring all accumulated experience to bear upon the conduct of the disease in the individual to a successful termination. But, after all, the main direction of our efforts would lie in precautions against its spread, and the speedy stamping-out of the disease by rigid disinfection of all excretory material. In other words, while the conduct of individual cases would not be neglected, we should realize that in the wider task of total eradication lay our chief duty.

Now tuberculosis is domesticated among us, and the dramatic and absorbing features of a more rapidly fatal and readily acquired disease are wanting; so that, while we are busying ourselves in the humane and worthy effort to help the stricken individual, the spread of the disease among more vulnerable persons goes steadily on, and systematic efforts towards the prevention of the distribution of infective material are almost completely ignored.

Let all the conditions which Hambleton and others urge — mistakenly, I think, as the cause of the disease — be fully considered and guarded against; let climatic, hygienic, and hereditary influences be made as favorable as possible; and let the influence of drugs be brought to bear whenever and however they safely and to good purpose may. To attend to these things is the duty of the physician. But beyond and above all this, is the problem of the total eradication of the disease. Its practical solution may and probably does lie far in the future; but it would seem unquestionable, in the light of modern science, that any systematic and intelligent effort in this direction must be based first of all on the universal recognition of the fact that a particular species of bacterium, and it alone, causes tuberculosis, although there are hosts of most important external and internal conditions which favor or retard the progress of bacterial invasion.

T. MITCHELL PRUDDEN, M.D.

New York, May 23.

Bassariscus, a new generic name in mammalogy.

Having lately had occasion to do with the quadruped commonly called *Bassariscus astuta*, my attention has been drawn to the fact that the generic name is pre-occupied in entomology. It is said to have been conferred by Hübner upon a genus of lepidopterous insects, 1821 or earlier. There being no synonyme of the mammalian genus, that I know of, a new name for the latter seems to be required. The above may be regarded as a diminutive of one of the several forms of a Greek word meaning fox, and the two species of the genus may be known as *Bassariscus astutus* and *B. sumichrasti*. The English equivalent would be 'bassarisk,' a term which may come into use, since we have not yet any single word in the vernacular as the name of the animal. As to the technical name of the family of bassarisks, it may be observed, that, if *Bassariscus* be untenable in this connection, then so is *Bassarididae*. The first tenable generic name in this family is doubtless *Bassaricyon* of Allen, 1876, whence it would appear that the proper name of the family is *Bassaricyonidae*.

ELLIOTT CORES.

Smithson. inst., Washington, May 14.

A needed invention in coal-mining.

In recommending air-jigs for separating coal from slate, I fear that Mr. Ludlow (*Science*, May 13) is on the wrong track. Two solids are readily separated by a fluid whose specific gravity is intermediate between theirs: the heavier sinks, the lighter floats. But if, as is usually the case, we must employ a fluid lighter than either, the heavier that fluid the more ready and complete the separation: hence the enormous disadvantage under which air suffers as a separating medium. Air-jigs, too, would probably break the coal much more than water.

Coal initially dry would suffer an apparently irreparable injury from absorption of water, if separated by wet jigging; but, for coal initially wet, means for using the waste water over and over appear to offer a more promising field than air-jigs.

HENRY M. HOWE.

Boston, May 17.

A noteworthy specimen of Devonian lepidodendron.

A noteworthy specimen of Devonian lepidodendron (*L. primaevum* Rogers?) has recently been added to the New York state museum of natural history at Albany. It is fifteen feet in length from the roots upward, measures thirteen and a half inches in diameter across the base, three inches at the broken upper extremity, and preserves in great beauty and perfection the cicatrices of the leaves, in places the narrow elongate-lanceolate foliage and the delicate rootlets.

The fossil was discovered in the Portage arenaceous shales of Naples, Ontario county, N.Y., by Mr. D. D. Luther of Naples and Mr. J. M. Clarke of Albany; and a portion of it, as much as had at that time been excavated, was described in Bulletin No. 16 of the U. S. geological survey. The continuation of the excavation added greatly to the length of the specimen, and exposed its base and roots. The trunk has been flattened in the shales and its tissue reduced to coal, but in its present condition it undoubtedly offers to paleo-botanists one of the most striking examples known of this genus of plants. It is interesting to observe, that, so wide a variation exists at different distances from the base in the arrangement of the cicatrices, one cannot but feel, upon examining the fossil, that, if it had been found in fragments taken from different spots, it would furnish all the necessary material for a half-dozen distinct species of lepidodendron, according to prevalent methods of determining these values. Moreover, towards the base the leaves are uniformly arranged on elevated longitudinal ridges, as in *Sigillaria*, showing nothing of the quincunx arrangement apparent higher up, and regarded as a diagnostic character of lepidodendron. In this region also the longitudinal ridges are interrupted by a series of varices suggestive of an equisetaceous mode of growth.

While it is to be regretted that the summit of the tree has been lost, it is a fortunate circumstance that preserved to science so fine an example of Devonian forest-growth. C.

Albany, May 18.

The Sonora earthquake.

In the report of the earthquake sent you a day or two ago, I think an error was made in the time stated. It should have been 2.48 local time, and 2.13 standard. Additional data and information are at hand, which I have not had time to carefully consider, but which only confirm my previous assertions. There was no great loss of life anywhere, all reports to the contrary notwithstanding. The central area of disturbance was about the Fronteras valley, and likely due to faulting. No eruptive disturbance has reliably been reported, and I can only iterate my previous assertion concerning volcanic action.

G. E. GOODFELLOW.

Tombstone, A. T., May 14.

SCIENCE.—SUPPLEMENT.

FRIDAY, MAY 27, 1887.

POLITICAL GEOGRAPHY OF CENTRAL AFRICA.

THE development of Central Africa is unparalleled in the history of discoveries. In 1877 its interior was totally unknown, and in 1884 we see the powers of Europe and the United States of America meeting in a conference to settle the affairs of this district, and acknowledging the young Kongo Free State.

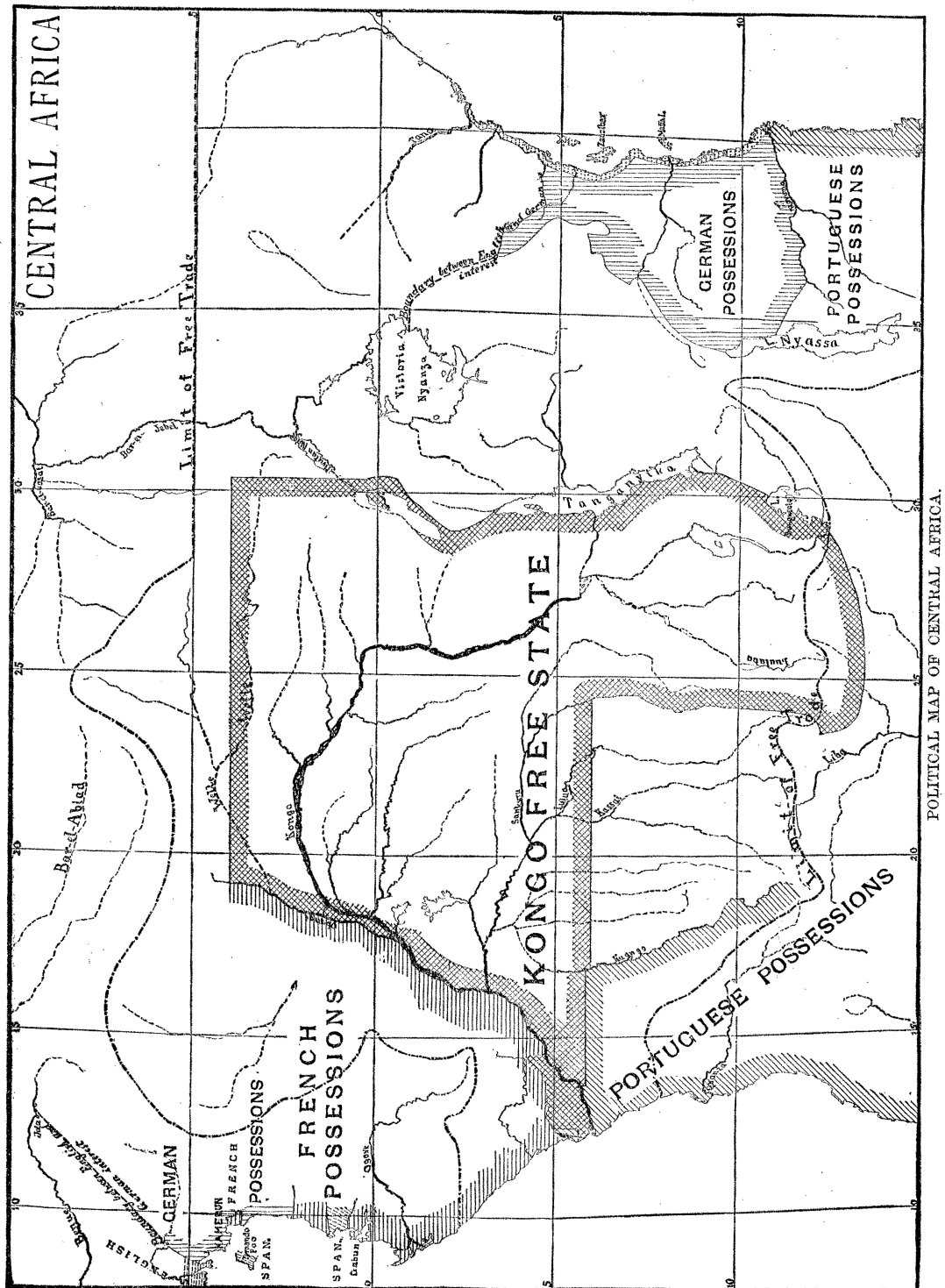
In September, 1876, the Association internationale Africaine, for promoting the exploration of Central Africa and opening it to commerce, was founded under the auspices of Leopold II., king of Belgium. The original intention of this association was to establish stations in eastern Africa, and to use them as a basis for further explorations in Central Africa; but when the news of Stanley's discovery of the Kongo route, and his reports of the wealth of the interior, reached Europe, the base of operations was at once transferred to West Africa. The Comité d'études du Haut-Congo was founded at Brussels in November, 1878, and Stanley was appointed leader of its enterprises and expeditions.

Stanley reached the Kongo in 1879, and at once proceeded to establish the station of Vivi at the farthest point accessible to steamers. In January, 1880, this work was finished, and he started on his way up the river. The route from Vivi to Isangila is extremely difficult, the river being impassable on account of the numerous cataracts and rapids, and the land being intersected by deep gorges and valleys. Though a single traveller can accomplish the distance from Vivi to Isangila in six days, it took Stanley eleven months to get his stores and the sectional steamboat to that place. Steep declivities had to be graded and rocks to be blasted before he was able to carry his bulky luggage to Isangila, which place was reached in December, 1880. From here he proceeded on the river to Manjanga, where the third station was established in May, 1881. In July, Stanley Pool was reached.

Meanwhile Savorgnan de Brazza had started from the Ogove, reached Stanley Pool, and induced Makoko, the chief of the Bateke, to accept the French protectorate. Though Stanley's intentions were thus forestalled by the enterprising

French officer, he did not hesitate to establish his fourth station, Leopoldville, on the left bank of the Kongo, in order to save this section from the encroachment of the French. In December, 1881, the first steamer floated on the upper Kongo, and no further obstacle lay between Stanley Pool and Stanley Falls. In 1882, Stanley established the station of Mswata, opposite Brazza's purchases, and visited Lake Leopold. In order to prevent the French laying hold on the lower Kongo, he sent, in 1882 and 1883, several expeditions into the district north of the lower Kongo, where stations were established and land purchased. In 1883 the steamer proceeded to Stanley Falls, and the stations of Aruvimi and Stanley Falls were organized. Meanwhile the Comité d'études du Haut-Congo had assumed the name of the 'Association internationale du Congo,' and at the same time diplomatic negotiations began in order to obtain the recognition of its possessions by the European powers.

When the results of Stanley's activity became known, France and Portugal claimed large tracts of land in which the association had established its factories. Brazza claimed the left bank of the river from the mouth of the Kuango to Stanley Pool as belonging to Makoko's territory, and Portugal maintained its old claim to the coast as far north as latitude 5° 12' south. The first to recognize the possessions of the Kongo association were the United States, which made a treaty with the association in April, 1887. As all commercial nations were interested in preventing a single power from getting control of the mouth of the Kongo and the rich countries of Central Africa, a conference was held in Berlin, the result of which was the recognition of the association as the 'Kongo Free State.' The negotiations for determining the boundaries of the state were not included in the programme of the conference, but were settled between the single states and the association. In February, 1885, a treaty with France was made at Paris, and the new state recognized by France. According to the stipulations of the treaty, France received the right bank of the Kongo from Stanley Pool to Manjanga, and the coast as far south as the mouth of the Chiloango. On the other hand, France relinquished its claim on the left bank of the Kongo. In the same month an understanding with Portugal was reached. Portugal received the south bank of the mouth of the Kongo, while the association



POLITICAL MAP OF CENTRAL AFRICA.

kept twenty-three miles of coast line on the north side of the Kongo.

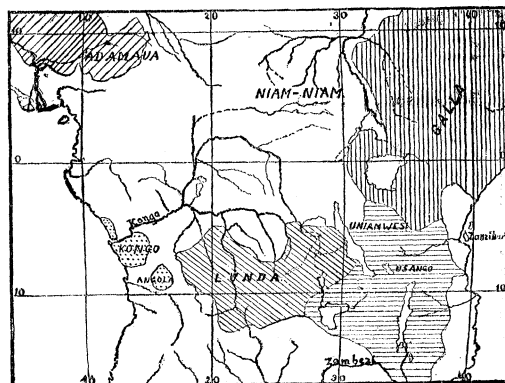
At the conference the neutrality of the new state was guaranteed by the powers, the right of the single states to declare their colonies in Central Africa as neutral in case of a war was established, and free trade was declared in the Kongo basin and the adjoining territory from the Atlantic to the Pacific Ocean. Thus a great step forward in the development of Central Africa was made.

After the consolidation of the Kongo Free State, the European powers defined the much-disputed boundaries of their colonies by special treaties. The Portuguese territory north of the mouth of the Kongo was enlarged by a treaty between France and Portugal, May 15, 1886, and the northern boundary-line between French and German territory was fixed on Dec. 24, 1885. It was only a few weeks ago that the doubtful boundary-line on the east side of the French possessions, which was originally between the Likoma and the Obangi, was determined. The French territory extends now to the Obangi River. After Germany had taken possession of Kamerun, its claims came into conflict with those of England. In July and August last it was decided that a line from the great bend of the Calabar (Cross) River to Jola on the Benue should form the boundary between the two colonies. By this treaty the navigable Niger and Benue, which form the best route into the interior of West Africa, came into the possession of the English. In East Africa we find the possessions of the German East-African company, which are under the protectorate of Germany. A consequence of their purchases was the conference of England, Germany, and France in December, 1885, to determine the extent of the sultanate of Zanzibar. This question was settled by an exchange of notes on the 1st of November, 1886. The principal point of this agreement was the determination of a line separating future claims of both states. This line, which runs from the coast to the Victoria Nyanza, may be seen on the accompanying map. South of the German possessions, the Kongo Free State, and the French possessions, the African coasts belong to Portugal. The extent of its possessions towards the interior is not limited by a boundary-line acknowledged by the powers. Germany may raise a claim to the country south of the Kongo Free State, which is almost exclusively known through the explorations of German travellers.

Our notes on the political geography of Central Africa would be incomplete without a description of the states of the natives. Though a great part of Central Africa consists of small communities

which do not form large states, we find several extensive empires, and several others have been destroyed since the Europeans invaded the country.

The peoples of Africa are frequently changing their habitations: large empires which are kept together by an energetic king, fall to pieces, and new ones take their place. Several large states, however, have existed for a long period. The most extensive of these is the empire of Muata Yamvo in Lunda. His residence is Musumba. The government is feudal, there being a number of sub-chiefs who govern their own territories independently, but must send tribute to the Muata Yamvo, and have to follow him in case of war. So long as they conform to these obligations, the tributary states are independent, and the Muata Yamvo does not even interfere with the election of a successor in case one of the chiefs dies. Several relatives of these sub-chiefs, however, must live in the Muata Yamvo's residence, being kept



STATES OF CENTRAL AFRICA (according to Fr. Ratzel).

there as a kind of hostage. Besides the Muata Yamvo, an unmarried woman called the Lukokeshu has a position of high rank in the state. The Muata Yamvo and the Lukokeshu are elected by a council, and the election of either of them must be confirmed by the other. The court of the Muata Yamvo consists of a number of councillors and an aristocracy. The whole people is called to an assembly to decide on war or peace and other important public affairs.

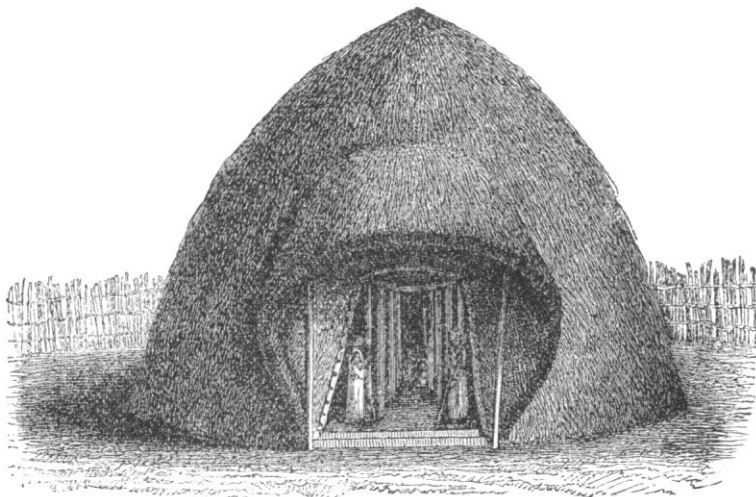
Similar to the constitution of this state are those of most other African states, — despotism combined with an oligarchy. The empires of Kongo, Angola, and Loango, near the mouth of the Kongo, had a similar form of government; Angola and Loango were probably tributary to the king of Kongo.

The history of the Watuta in East Africa shows the origin of the states of that region, so far as

they are under the influence of Zulu-like tribes. Between Lake Nyassa and the Rovuma we find the Wahiyao, and on the plateaus west of the lake the Maviti, both warlike tribes closely related to the Matabele and Zulu. About 1840 the Watuta, who were a sub-tribe of the Maviti, separated from the main body on a predatory excursion which extended far north. They came to Urori, and after a war of five months with the strong and warlike tribe of that country, the Warori, being unable to subdue them, went north-west, and made war upon the inhabitants of Ujiji. Thence they turned north-east, fought with the Wahua and Warundi, and reached the Victoria Nyanza, where they remained for several years. They did not settle permanently, but returned to

The position of Europeans in the equatorial province has become very difficult through the hostility of the king of Uganda. While Mtesa, the last king, was friendly to the Europeans, his successor, Mwanga, has prevented them from passing his land, and the death of Bishop Hannington is due to him. At the present time he keeps Emin Pasha and his companions from Zanzibar, and his attitude compelled Stanley to take the Kongo route. A brief account of this region, which is so frequently mentioned in reports from Africa, may be of interest.

Formerly the large empire Kitara occupied the whole region between the Victoria Nyanza and Mvutan Nsige. In course of time it had the same fate as most other African states : it was divided



AUDIENCE-HALL OF KING MTESA (according to Stanley).

Usambara and Ugomba, where Mirambo founded the empire which has so frequently been described by European travellers. The development of this tribe to a powerful kingdom is characteristic of the unsteadiness of African states, the existence of which greatly depends on the personality of the chief.

In north-eastern Central Africa we find the Galla, Massai, and Wahuma. These are warlike tribes of herdsmen who have subdued the agricultural tribes which formerly possessed these districts. The Galla states are remarkable for the democratic character of their constitution. The chiefs are elected for eight years, and their power is limited by a council. They have no residence, but must continuously travel from one village of the tribe to the other to settle disputes and perform other duties belonging to the office.

into several smaller kingdoms, but every one of these is still powerful. Uganda, Unyoro, Karagwe, and Usinja are fragments of the old empire. The inhabitants of the land belong to two different races,—the agricultural Waganda, and the Wahuma, who are herdsmen. The royal family belongs to the Wahuma, who keep apart from the Waganda, have a language of their own, and live in separate villages. The Waganda are chocolate-colored, and have short woolly hair. The Wahuma are of a far lighter complexion. They have straight noses, thin lips, and large lustrous eyes. The traditions of the Wahuma refer to their immigration from the north, and their anthropological features agree with this statement, they being very similar to the Galla.

The power of Uganda is principally due to its military organization. The population consists

of four classes, — slaves, peasants, sub-chiefs, and chiefs. The peasants, who are the main body of the population, form the army. The sub-chiefs, who are elected from among the peasants, govern the provinces, and have the command of a certain number of soldiers. They are responsible to the Wakungu, the chiefs. These form a council, which in reality decides the affairs of the state. Every one of the chiefs must live three months out of every year at the residence of the king. Thus the state is thoroughly centralized, and the government has as much influence on the borders of the state as in the central provinces. If war is decided upon, the war-drums are beaten, and the whole army assembles before the royal palace. In time of peace the Waganda wear a toga made of bark; but in time of war they lay it aside, paint their faces white and red, and go into the battle naked, with the exception of a piece of cloth wound around the loins. Their weapons are beautiful spears with points more than a foot long, and oval shields of light wood covered with twigs and having a boss in the centre. Besides the spears, they use powerful bows, and poisoned arrows with formidable barbs. It is the privilege of the king to bear a copper lance. Armed with two of these lances, and wearing his shield, he stands before the entrance of his palace, surrounded by the chiefs, and gives his orders to the army. The palace is built of reeds and straw, and is about a hundred feet long, the roof resting on heavy timbers. The accompanying sketch shows the hall in which Mtesa gave his audiences, and where Stanley met him. A large fleet of canoes which the Waganda have on the Victoria Nyanza makes their army still more powerful. Some of their canoes carry as many as forty men, and it is said that from sixteen to twenty thousand men can be transported by the whole fleet.

This powerful nation is strong enough to shut off the region north of the Victoria Nyanza, and to prevent the passage of caravans through its territory. The distrust of the new king Mwanga hinders the work of European explorers and missionaries just as much as the friendliness of Mtesa had helped them. Though the kingdom has been for two generations in contact with Arabs, and later on with whites, it has retained its independence and power.

PHYSICAL GEOGRAPHY OF CENTRAL AFRICA.

THE map of Central Africa which accompanies the present number shows the river system of the Kongo, the head waters of the Nile, and East Africa. This part of the continent forms one of

the large plateaus which give Africa its peculiar character. An immense highland occupies the continent south of a line drawn from Abyssinia to the Niger. Its rim is formed by mountain-ranges, which fall off in terraces toward the sea. A depression indicated by the valleys of the Kunene and Zambezi separates the plateau of South Africa from that of Central Africa. The eastern side of the latter consists of a number of high mountain-ranges and plateaus. The highlands of the Bangweolo and Nyassa lakes, which are from 4,000 to 5,000 feet high, extend to the caravan route leading through Unyamwesi. Its descent towards the Zambezi is very steep, while in the north-west it gradually falls off towards the plateau of the Kongo basin. Lake Bangweolo, which occupies the south-western portion of the highland, is 3,700 feet high. North of Unyamwesi the land rises to the mountainous district of the Victoria Nyanza and Muta Nsige, which attains a height of 11,000 feet in the mountains of Karagwe and Ruanda, west of the Victoria Nyanza. East of this region enormous volcanoes indicate the edge of the plateau, the Kilima Njaro rising to 19,000 feet, and the Kenia to 16,000 feet, in height. North-east of the Victoria Nyanza we find the highlands of Abyssinia.

This mountainous district contains the sources of all the rivers of Central Africa except the southern tributaries of the Kongo, which come from the swamps on the watershed between the Kongo and Zambezi. The latter river drains the southern slope of the plateau. Numerous small rivers, among which the Rovuma and Rufiji are the most important, descend from its eastern slope: the lofty mountains of Karagwe feed the sources of the Nile, and the Kongo has its origin on the western side of these highlands.

The large lakes which collect the head waters of all these rivers are characteristic of this part of Africa. Steep mountains surround the stormy Lake Nyassa, which occupies a long and deep valley on the southern side of the plateau. The large basin of the Victoria Nyanza is in part surrounded by low hills, and filled with many islands, but on its western side the steep mountains of Karagwe reach to its shore. This lake and the Mvutan Nsige are the collecting basins of the White Nile. From the Victoria Nyanza, which is 4,100 feet high, the Nile descends 1,350 feet, until it reaches the Mvutan Nsige, 2,750 feet above the level of the sea.

The Tanganyika is situated on the western slope of the highlands, and sends its water by the Lukuga into the Kongo. When the rivers belonging to the Kongo system have descended the terraces forming the eastern rim of the highland,

they flow slowly towards the west coast, unobstructed by rapids or cataracts until they reach the western rim of the plateau. Here the mighty Kongo and the smaller river rush down its steep side in roaring rapids and cataracts.

The character of this district depends to a great extent upon the meteorological phenomena, particularly on the amount of rainfall. North and south of the district included between latitudes 20° north and 20° south, the aridity of the climate, which is due to the trade-winds, produces the vast deserts and steppes of the Sahara and Kalahari. In the parts adjoining the equator we find rainy and dry seasons interchanging. On the west coast the climate is influenced by the prevailing south-westerly winds, which tend to lower the temperature, particularly as they blow from the cold Benguela current. The isothermal lines on the west coast approach the equator much nearer than do those on the east coast. There are two seasons, — the cool and foggy one, which has no thunder-storms; and the hot, rainy season. The dry season begins towards the end of May, and lasts, in the southern parts until August, in Loango until the middle of October. Farther north, at Gabun, the dry season lasts from June until the middle of September, but slight showers of rain occur in all months. During this season a whitish haze obscures the sun: early in the morning thick fogs cover the land, and the dew is very plentiful. The fog produces a drizzling rain, which is of great importance for the development of the vegetation. While the west coast south of the equator has little rain, the east coast, which is under the influence of the south-easterly trade-winds, is very damp. From May until October south-westerly winds prevail on this coast, while later on the trade-winds are blowing. The latter come from the warm Mozambique current, and are saturated with vapor, which is precipitated on the mountain-ranges of the east coast. Throughout the interior, summer rains prevail, but near the tropic of Capricorn the amount of rain is decreasing. Owing to the humidity of the climate, the rivers are very numerous, and carry great volumes of water. The watersheds of the whole district are very indistinct; the head waters of the Welle and Nile, and those of the Sankuru-Kasai and the Zambezi systems, being in close proximity, and not separated by elevations. The same is probably the case between the Welle and Shari, and until quite recently we did not know whether the Welle belonged to the Kongo or to the Tsade system. The swamps and lakes at the head of the Kasai probably form a bifurcation between that river and the Zambezi: according to Livingstone,

the Dilolo Lake has a northern and a southern outlet.

The basin of Lake Bangweolo, and its outlet, the Luapula, may be considered the source of the Kongo, but the Lualaba is not inferior to it in size: and after both rivers have joined, above Nyangwe, the Kongo carries a great volume of water. Below Stanley Falls the Lubilash and Ubinji join it, and the river takes a westerly direction. It is a characteristic feature of the Kongo basin, west of longitude 25° east, that all rivers take a westerly direction. In the north we have the Welle-Makua, with its mighty tributaries the Werre and Mbomu. This river, which very probably empties into the Obangi, is one of the most important tributaries of the Kongo; but the Sankuru system, which drains the southern portion of the basin from longitude 15° to 25° east, is not inferior to it. During the early time of African travels, news reached us of the enormous Lake Sankuru, which at last proved to be the river system, which is now tolerably well known. The Sankuru has its source near the foot of the western slope of the East African highland, which is indicated by the numerous lakes of the upper Lualaba. As far as latitude 5° south it runs in a northerly direction, and then turns to the west. We are not sufficiently acquainted with the relief and geology of Central Africa to understand why the numerous rivers running south and north very close to each other suddenly take a westerly turn in this latitude. In the most central parts of the Kongo basin, which is situated between the Sankuru and Mbomu, this is the predominating direction. Among the tributaries of the Sankuru, the Lubilash, Kasai-Lulua, and Kuango, with its tributaries, carry the greatest volume of water. It seems that the north and south direction of the western part of the Kongo is caused by its approach to the western watershed. It is doubtful whether the Kadei and Nana, which are known by Flegel's inquiries in Adamaua, belong to the Kongo system. Here is the part of Africa which is least known. The coast tribes, for fear of losing the trade between the interior and the coast, prevent explorers entering the continent, and no traveller has reached that district either from the Tsade basin or from the Welle-Nile watershed. Besides this, the country east and west of the Kongo above Stanley Falls is unknown, and so is the territory north-east of the Victoria Nyanza.

The central depression between the plateaus of Central and North Africa is indicated by the Shari and Bar-el-Arab. The upper part of the former is still unknown, the south and north tributaries of the latter having been the field of Schweinfurth's, Junker's, Lupton's, and Emin's

explorations. On the west side we find high mountains in Adamaua, — which probably form the north-western corner of Central Africa, — and the volcanic Kamerun Mountains, which lie on one line with those of S. Thomé and Anno Bon.

THE PEOPLE OF CENTRAL AFRICA.

THE northern boundary of the Bantu language, to which almost all tribes and nations of Central Africa belong, is a line running from Kamerun to the outlet of the Mvutan Nsige, including the Victoria Nyanza, thence turning south to the Kilima Njaro, and reaching the coast in about latitude 1° south. As compared with the large area occupied by dialects of this linguistic stock, the extent of other languages is very limited. Those of the negroes of the upper Nile, the Niam-Niam and Mangbatu, the Galla, and also those of the Benue and Central Sudan, do not belong to this stock; and it is impossible, with our present knowledge, to classify them properly.

The anthropologist finds even greater difficulty in classifying the races of Africa than the linguist, for the different types of African people are connected by numerous links. There are only a few places where a characteristic difference in appearance may be observed. As one instance we mention the remarkable light tribes of the Welle-Nile watershed, — the Niam-Niam and Mangbatu, and the scattered dwarfs of Central Africa. In comparing the ethnological peculiarities of the Niam-Niam with those of their neighbors, it strikes us that the Fan or Mpongwe, who invaded the Gabun region from the east, are very similar to them, and that their characteristic throwing-knife is found in southern Adamaua, and in slightly differing forms over the whole area north of the Kongo.

The dwarfish Mucassequere of the Kuando, south of Lunda, the Watwa of the southern Kongo basin, the Akka of the Welle, and several other West African tribes, are, in their anthropological appearance, very similar to the Bushmen of South Africa. Their height is about four and a half feet, they are of a yellowish complexion, and have woolly hair. The scattered occurrence of these tribes all over Central Africa makes it very probable that they inhabited the whole country before the invasion of the Bantu. Their languages are little known, but all of them seem to have adopted to a great extent that of the people with whom they live. They do not till the soil, but live almost exclusively as hunters.

The majority of the negroes live on the products of agriculture and stock-raising. There are

no tribes without agriculture in Central Africa, except the dwarfish Watwa and Akka. Though their implements are very simple, they clear the dense woods, and fence in their fields. Hirse is the most important grain they grow. It is cultivated in all parts of Africa. Sorghum, manioc, and batatas are grown in the lower countries, maize and pulse on the highlands. In Uganda, bananas are the principal food. Stock-raising is the favorite occupation of many East African tribes. The herdsmen are frequently warlike nations who have subdued agricultural tribes. The Galla, Wahuma, and Watuta have founded empires of this kind. On the upper Nile the natives are engaged in both stock-raising and agriculture. Cattle, sheep, goats, dogs, and poultry are raised by these people.

The most remarkable industry of Africa is that of iron-working, which is known in all parts, the Bushmen alone being unacquainted with it when they became known to the Europeans. The Africans know how to obtain the iron from the ores, and manufacture beautiful implements of it. Besides iron, they manufacture copper implements and make copper and iron wire. The negroes do not know how to tan skins, but soften them by scraping and beating; neither do they practise the art of joining wood; while carving, plaiting, and weaving are highly developed.

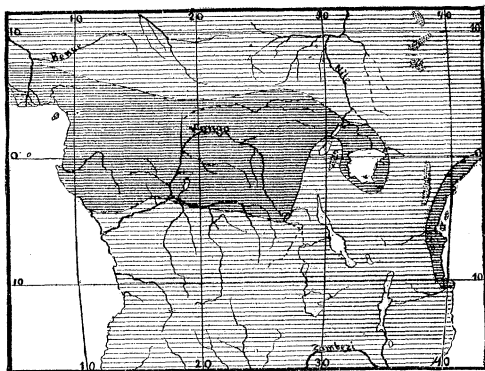
The civilization of the negroes is not at all a low one. Their mode of life, their industry, and their political institutions are ample proof of this. Large empires founded by men excelling in intelligence and character, and extensive migrations of energetic nations, are characteristic of its history. The observations of all explorers show that arts and industry are far more developed in the interior than near the coast. Here, as everywhere else, the contact with nations of a higher civilization, the whites and Arabs, tends to destroy the native culture. Here the ruthless Arabian slave-hunters devastate regions which were flourishing before their arrival, and the final destiny of the Africans will depend to a great extent on the end of the final struggle between the whites and the Arabs.

THE VEGETATION OF CENTRAL AFRICA.

THE peculiar character of the landscape of Central Africa is due to the great extent of its highlands and the frequently alternating woods and savannas. In the rainy districts of the west coast north of the Kongo, dense forests prevail, but farther south the vegetation is not so luxuriant. Here we find the baobab and the plants characteristic of the savannas of the central plateaus. But even in

the region of forests savannas are not wanting. Wherever the local climate is dryer, we find them, and the irregularity of the rainfall in this region may sometimes destroy woods. But besides this, the methods of agriculture applied by the natives are destructive to the forests, which are burnt or cut down. As the natives frequently remove their habitations from one place to another, large tracts of forest are annually destroyed.

The natives distinguish two forms of vegetation, — the *campina* and the forest. European travellers, particularly Pechuël-Loesche, who studied the vegetation of Central Africa, describes the character of the country as follows: In the *campina*, from one-fourth to one-half of the ground remains barren, while the rest is covered with grasses from three to six feet high. This is more particularly the case in the open *campina*,



VEGETATION OF CENTRAL AFRICA (according to O. Drude).

Dark lines, evergreen woods; light lines, woods with deciduous foliage and savannas; dots, tropical alpine flora.

which consists of *Andropogon*, *Cymbopogon*, and *Ctenium*. The period of vegetation is the season of thunder-storms, but before its end the seeds are ripe and the grasses begin to fade and dry up. There are only few shrubs mixed with these grasses, — *Leguminosae*, *Compositae*, *Malvaceae*, and *Verbenaceae*. Another characteristic form of vegetation is the bush, which is composed of evergreen thornless shrubs from twelve to fifteen feet high, with rigid leaves of a bluish or dark-green color. The bush is found on hills and slopes or on the plains in patches surrounded by the *campina*. Pechuël-Loesche distinguishes besides these the 'bush woods' and 'high woods.' The genera of these are identical, but the impression is very different according to the prevalence of high trees or of lower forms. In the 'high woods,' evergreen-trees prevail, the crowns of which are interwoven with climbers, while

enormous trees with deciduous foliage tower above them. Though the multiplicity of form of the American tropical woods is not found here, they are described as not less impressive and grand than any other tropical forests.

The accompanying sketch-map shows the distribution of this kind of woods. They occupy almost the whole of the Kongo basin except the highlands of Karagwe and the region adjoining the watershed between the Kongo and Zambezi. On the east coast they are confined to a narrow belt adjoining the coast. The rest of the country except the summits of the highest mountains is occupied by savannas, and forests of trees with deciduous foliage. In East Africa the district between the Kilima Njaro and Lake Rikwa is almost exclusively occupied by savannas. The caravan routes from the east coast to the Tanganyika cross it in Ugogo.

The deserts and steppes north and south of the fertile belt of Central Africa do not belong to the district under consideration, but are confined to the area north of latitude 10° north, and south of latitude 15° south. On the west coast, however, vegetation becomes more scanty south of the Kongo, and in latitude 12° south some parts have the appearance of real steppes.

THE latest additions to our knowledge of Central Africa are the exploration of the Mongalla and of the tributaries of the Obangi. We referred in *Science* of April 1 to Baert's exploration of the Mongalla. From the map in *Le mouvement géographique* of May 8, it appears that Baert reached latitude 2° 50' north, and longitude 21° east. The mouth of the Mongalla on Baert's map is 35' farther east than on Grenfell's map. The exploration of this river is very important, as it belongs to the unknown region of the watershed between the Welle and the Kongo. The only map of the tributaries of the Obangi yet published is that of the Ngiri, a small river draining the peninsula between the Kongo and the Obangi. In latitude 4° north the explorer of the Obangi, Captain van Gele reached the cataract of Zongo, which prevented further progress. This cataract is formed by a range of hills six or eight hundred feet high, through which the Obangi has cut its valley. The problem of the western tributaries is very essential to our knowledge of the orography of Africa, as the north-westerly rim of the large central plateau is still totally unknown.

—Dr. H. Labonne, who made some important explorations in Iceland last summer, left Cherbourg on April 15, to continue his studies on the geysers and glaciers of that island (*Gaz. géogr.*, April 21).